THE PHILIPPINE
JOURNAL OF SCIENCE
B. TROPICAL MEDICINE

VOL. XIII NOVEMBER, 1918 No. 6

ENDEMIC MALARIA IN THE PHILIPPINE ISLANDS AS A MILITARY PROBLEM [1]

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New institutions in a developing country almost always bring new problems of a troublesome and perplexing nature. The degree of success that attends efforts to solve these problems is in direct proportion to the foreknowledge and farsightedness of those who are called upon to cope with them. With the recruiting of large bodies of men, and their organization into a military unit, problems of vital concern to those of the medical and allied professions charged with safeguarding the health of the military force and of the public in general are almost certain to develop. Closely allied with these problems are our obligations, not only to our own community, but to others with whom we come in contact, and we should be culpably negligent should we fail to bear them well in mind and exert ourselves to meet them.

In this paper I shall deal with a single phase of one of these problems only—the malaria problem—and I shall try to present an outline of some of the recent work on the subject, which I consider pertinent to the question. Even at the risk of being termed an alarmist, I shall try to show that aside from the peril of cholera, typhoid, the dysenteries, and smallpox malaria constitutes one of the gravest medial problems, if not the gravest, with which an army medical corps has to deal in connection with organization work in the tropics.

Another blood parasite that is almost equally to be dreaded

[1] Read before the Manila Medical Society, August 5, 1918.

is the nematode *Filaria bancrofti.* Its transmitting agent, *Culex fatigans,* is common in Manila and the vicinity and is of wide general distribution.

There was recently published a newspaper article [2] based on figures compiled by the Bureau of Health and issued on June 28, 1918, in which attention was called to five diseases that the Philippine Islands must fight. The statistics showing the deaths from these five diseases during the last decade are here given:

Smallpox	21,978
Beriberi	47,052
Cholera	52,804
Tuberculosis	192,841
Malaria	247,675

These figures furnish an interesting illustration of the psychology of the masses. Generally, two or three cases of cholera or smallpox will suffice to reduce the average community to a state of mind bordering on hysterics, and to evoke a prompt and strong reaction on the part of the local health authorities.

The constant presence of beriberi and tuberculosis brings about another strong reaction in the form of the establishment of societies, organized to supplement the work of the health authorities. This is quite as it should be; but, meanwhile, the effective partnership of *Anopheles* and *Plasmodium* shows in ten years a ledger credit in this country of nearly a quarter of a million human lives unostentatiously, but none the less effectively, terminated by malarial fevers and their complications and sequelæ.

Many prominent capitalists and business men of the Philippine Islands consider malaria one of the most serious impediments to the commercial and economic development of the country that exists. Notwithstanding all this, no one seems ever to have dreamed of founding an antimalaria society, or of going out on the highways and byways to solicit funds for the suppression of malaria or for the establishment of institutions for the treatment of those who have fallen victims to it.

The distribution of malaria in the Philippine Islands, as shown by the records of the Bureau of Health, is a matter of some interest, especially when compared with two other serious diseases—cholera and tuberculosis. I quote from the published records of the Bureau of Health,(24) as to the causes of death during the year 1916.

[2] *Manila Daily Bulletin* (July 1, 1918), 6.

TABLE I.—*Deaths from cholera, tuberculosis, and malaria in the Philippine Islands during 1916.*

Province.	Malaria.	Malarial cachexia.	Cholera.	Tuberculosis of the lungs.	Tuberculosis of other organs.
Abra	621	9	----------	145	2
Agusan	142	10	----------	15	2
Albay	730	69	631	731	78
Ambos Camarines	1,007	66	895	709	87
Antique	240	----------	47	489	20
Bataan	266	99	153	110	18
Batanes	6	1	----------	12	2
Batangas	786	39	75	608	40
Bohol	109	11	27	408	101
Bulacan	547	29	808	941	23
Cagayan	903	17	----------	351	30
Capiz	727	54	97	727	51
Cavite	691	130	235	250	26
Cebu	871	41	12	902	108
Ilocos Norte	516	64	----------	232	91
Ilocos Sur	831	3	----------	310	16
Iloilo	880	166	1,653	1,476	102
Isabela	523	34	----------	211	16
Laguna	713	127	----------	560	42
Leyte	----------	----------	----------	----------	----------
Mindoro	510	----------	12	222	2
Misamis	669	4	228	318	37
Nueva Ecija	525	70	9	477	31
Nueva Vizcaya	127	139	----------	90	2
Occidental Negros	1,049	154	1,293	1,021	68
Oriental Negros	1,067	6	----------	229	63
Palawan	66	14	----------	34	9
Pampanga	593	129	203	647	19
Pangasinan	3,119	197	2	1,476	80
Rizal	276	79	377	415	111
Romblon	146	31	138	67	11
Samar	525	13	256	218	104
Sorsogon	----------	----------	----------	----------	----------
Surigao	218	----------	----------	33	13
Tarlac	391	50	1	412	15
Tayabas	790	158	10	702	43
Union	321	104	----------	297	9
Zambales	5	122	31	269	9
	21,506	2,239	7,193	16,114	1,491

These figures will be seen to total as follows:

Cholera	7,193
Tuberculosis	17,605
Malaria	23,745

In other words, the deaths from cholera and tuberculosis, combined, were only 1,053 in excess of those reported as being caused by malaria and malarial cachexia.

Two entire provinces—Leyte and Sorsogon—are unreported; and other questions, such as the accuracy of diagnosis in all cases and the difficulty of securing correct reports from the wild tribes and the sparsely settled and inaccessible districts in the country, are apparently not considered. So that, if a precise study of the incidence and distribution of malaria in the Philippine Islands were to be made, the statistics given above would have to be carefully analyzed. In the main, however, the figures probably give a fair idea of the proportion malaria bears to the other two most dreaded diseases, and of its relative extent and distribution throughout the Islands.

The death rate from malaria, as evidenced by these statistics, is startling enough; but there is another factor which has a direct bearing upon the effects of malaria on the population of a country, which seems to be totally neglected although, on reflection, it must appeal to every physician practicing in the tropics. That factor is furnished by death of the fœtus in utero as a result of a supervening attack of malaria suffered by the mother. Cases in which the pregnant woman aborts during an attack of malaria are all too familiar; under treatment she may survive, but her child is lost. I can give no figures as to the extent of this; however, I can cite some interesting data collected by the sanitary authorities of Burma(3) based on the child population of all the districts in that province.

The province was very thoroughly canvassed and a large number of persons examined. The table gives comparative figures of the child population, under 10 years of age, per hundred married females of child-bearing age (15 to 40 years). It is probably a reliable statement of the relative proportional distribution of the child population and of the relative productive capacity of the female population in the different districts. Inspection of the figures will show that the child population is materially reduced in malarious districts as contrasted with those that are nonmalarious. The table follows:

TABLE II.—*Child population of Burma.*

Malarious Districts.	Children.	Relatively nonmalarious districts.	Children.
Kyaukee	186	Magwe	245
Mandalay	188	Sagaing	244
Thayetmye	198	Meiktila	244
Prome	198	Myingyan	240
Yamethin	208	Lower Chindwin	236
Ma-ubin	210	Pakokku	223
Schwebo	218		

All this should help us to form an opinion as to the extent of the fundamental problem that will be presented by the importation into Manila and its vicinity of several thousand men, drawn from the various provinces in the Islands [8] and destined to form the ranks of a military unit. That a not inconsiderable proportion of these men will prove to be carriers of the malarial parasite is a probability that it will not be safe to disregard; that, as such, they will constitute a source of danger naturally follows.

First, they will be a source of danger locally; for Manila harbors mosquitoes of the malaria-transmitting type, and local conditions show a tendency to become increasingly favorable to their development. However, it is not particularly my purpose to deal with the Manila problem in its especial reference to the danger to the civilian population of that city.

Secondly, they will constitute a serious source of danger to their camp mates wherever an encampment may be established. Before such an encampment is established a careful preliminary survey of the site proposed should be made by thoroughly competent men. Neglect to do so may give rise to an exceedingly discouraging and depressing experience, especially if the camp be located in proximity to a native village where malaria is almost certain to be endemic, if not epidemic. In this connection Hoffman(14) lays stress on the value to the army medical corps of the services of an expert entomologist.

Lastly—and herein lies a duty to those with whom they may be called upon to serve, and that duty involves a heavy obligation—there is the danger to troops from other countries, should the fortunes of war send the Philippine contingent to associate with them. Unless the work of weeding out or sterilizing malaria carriers is conscientiously and effectively carried out before leaving the home country, the troops may do far more harm than good. They are certain to be the bearers of new and malignant strains(5) of the parasites. It would not be a new experience, for other troops have come from the Far East bearing similar indirect aids to the enemy.

Important and destructive as they are, the intestinal parasitic diseases constitute a more controllable problem among troops at war than does malaria. Trench hygiene will, within certain bounds, control the diseases conveyed by contaminative methods;

[8] Attention is particularly directed to the returns from Ambos Camarines, Oriental and Occidental Negros, and Pangasinan, which report deaths caused by malaria varying from 1,000 to more than 3,000 during 1916.

but in a bullet-swept country, dotted with water-filled shell holes, or in places still more favorable to the development of *Anopheles* there is little opportunity to control malaria through the eradication of mosquitoes. Recourse must be had to quinine prophylaxis—the efficacy of which in all cases is open to doubt—or to the elimination of carriers of the parasite. As suggested in a previous paragraph, much can be done in the home country to minimize the danger, before the troops leave for the front.[4]

The formidable problem presented by malaria on the battle line and at the base has been well borne in on the military surgeons of all countries during the present struggle. The protean nature of the disease itself is perfectly familiar to every physician. Carles(4) places malaria in the same class with entamœbiasis and syphilis, as a disease eminently chronic and characterized by frequent revivals of manifestations, which requires persistent treatment over years, as is the case with syphilis and entamœbiasis. He considers every man suffering from grave malarial infection disqualified for duty for a period of from six months to a year. In such cases every return to a fatiguing occupation brings about a new exacerbation and a general decline in health as a consequence.

Gill(12) has recently made an interesting inquiry into malaria as it exists in the Indian army. In his opinion the greater part of the sickness in the native Indian army is attributable, either directly or indirectly, to malaria. In the Punjab, for instance, one of the great recruiting grounds, the recruits come from a population that is widely infected every year, and in some years grossly infected. Examination of the men in the ranks as well as of the recruits has shown that a large proportion of them,

[4] The problem of prophylaxis against malaria in tropical countries presents difficulties that are not met in most temperate climates. The importance of the elimination of the anopheline mosquito is by no means to be discounted, for it is of incalculable value in communities peopled by persons of intelligence and having a well-organized health service. But in sections of a tropical country, to which a health service has not been extended, the problem is different. In such places the eradication of breeding places of the mosquito, except under the most favorable natural conditions, is virtually an impossibility. No aid in the carrying out of antimosquito work can be expected from semicivilized populations. Unless it is possible to enforce what virtually amounts to military discipline, the systematic use of quinine as a prophylactic cannot be carried out. The screening of houses or even of beds cannot even be dreamed of. Of all the health problems met in such communities, malaria is by far the most formidable. *The eradication of malaria under these circumstances, still remains a laboratory problem and will so remain until means are discovered for killing the gametocyte in the human body.*

while seemingly in perfect health, show enlarged spleens. Cases of this character may never enter the hospital at all, or they may enter to receive treatment for some other ailment contingent upon chronic malaria, although not so recorded on the hospital returns.

Gill goes on to state that the problem of the prevention of malaria in war resolves itself largely into the prevention of malaria, in cantonments at the very least, in times of peace—this in order that the army may confidently take the field free of autogenous infection, especially if conditions there be favorable to the spread of malarial infection.

Gill has shown the conditions met in India by the recruiting staff. The sequel at the front is shown by Woodcock.(36) I quote from the latter author (p. 300):

> Until July there was scarcely any malaria, but during that month it began to increase. The worst months were September and October. Parasites were found in forty-three per cent of the cases, and especially among the Indians; quite five or six per cent in addition were obviously malarial bloods, although no parasites could be found. The findings are summarized in Table IV.

TABLE IV.—CASES OF MALARIA, AUGUST 1 TO NOVEMBER 30 INCLUSIVE.

	Examinations made.	Number positive.	Malignant tertian.		Benign tertian.		Quartan.	
				P. ct.		*P. ct.*		*P. ct.*
British	463	178	66	37	112	63	0	0
Indians and Egyptian Labour Corps	374	192	153	79.7	37	20.2	2	1
Totals	837	370	219	59.2	149	40	2	0.5

[The form of this table differs slightly from the original, but the numbers and headings are unchanged.—EDITOR.]

Among the British, benign tertian was twice as frequent as malignant tertian (pernicious), but among the Indians and Egyptian Labour Corps the malignant form was by far the most common. The rarity of quartan cases was noteworthy, only two being met with, both occurring in Indians. I was struck by the scantiness of the parasites in quite a number of the benign tertian cases among the British. Probably insufficient prophylactic dosage of quinine was responsible, checking but not completely inhibiting the development of the parasites.

In all the British malignant cases, the parasites (in the ring-form) were frequent or numerous, whereas the contrary was often the case among the Indians. On two or three occasions, malignant parasites very bacilliform in character were seen, but a few typical rings could always be found by searching. *Crescents were never found in the British cases, as nearly all of these were new infections.* [The italics are mine, F. G. H.]

Of course these figures would require careful analysis if one were to establish a proportion of infections among the British troops as having been derived from the Indians and the Egyptians. The predominance of benign over malignant infections in the British troops might then be found to be due to the comparative scarcity of anophelines of the species suitable for transmitting the malignant parasites. The fact remains, however, that the Indians and Egyptians seem to have been preponderant as harborers of the malignant parasite in a late stage of its development; and, even if they were not responsible for the incidence of the disease among the British, they not only helped to fill the hospitals, but also caused a corresponding decrease in the efficiency of their unit.

The baleful influence of malaria is by no means restricted to the medical side of the military hospital. Vandenbosche(34) has made a study in Salonika of the effects of malaria on wounds. Many of the phenomena he records are more or less familiar to physicians who have practiced in malarious regions. He states that even slight wounds will bring on an attack of malaria in patients who have previously suffered from the disease and that operations frequently have the same effect, the paroxysm occurring from one to six days after the operation. Such relapses, according to Vandenbosche, are prone to follow chloroform anæsthesia, and he recommends the substitution of ether. From my own experience in connection with a series of recent surgical cases at St. Luke's Hospital, Manila, in collaboration with Dr. A. F. Coutant, I incline to the opinion that relapse may also follow prolonged ether anæsthesia.

Vandenbosche's observations bear out those of Gill: that, in intensely malarious regions, latent malaria is all the more dangerous since in those districts persons, who to all appearances are perfectly healthy, may yet be gametocyte carriers, even though they had manifested no symptoms of the disease.

In his rounds of the hospitals in Salonika, Vandenbosche was able to observe most diverse hæmorrhagic phenomena in malarious subjects. These took the form of epistaxis which was occasionally fatal, hæmoptysis, hæmaturia, and petechial and ecchymotic patches. He regards every malarial subject as a potential "bleeder" and advises that surgical procedures be undertaken only under the strictest precautions. He points out the tendency of the disease to blur the clinical picture produced by a wound or by other complications, and admonishes surgeons to remember the possibility of malaria before enlarging or opening a wound on elevation of temperature. Malarial gangrene

he mentions as a rare but possible complication. He also speaks of cases of malaria that simulated appendicitis so closely as to bring the patient to the operating table.

The frequent failure of protozoan parasites to play the game according to the rules is a constant source of perplexity to physicians and parasitologists. It has long been an accepted rule that an attack of malaria might be expected to develop in from ten to fifteen days after the bite of an infected anopheline. Garin(10) dissents from this, and cites his evidence to the contrary, secured through a study of conditions in Macedonia. He produces evidence of a clinical and microscopical nature, tending to show that persons may become infected with malaria but remain in perfect health for a more or less indefinite period, until the introduction of some extraneous factor causes the infection to light up and become active.

This behavior on the part of the parasite he attributes to the possession of a partial and variable degree of immunity on the part of the host. This immunity he believes to be partly natural and partly acquired, the acquired immunity having developed as a result of the prolonged use of quinine as a prophylactic. He believes the disease may become active in patients of this type following upon severe muscular fatigue, wounds, surgical operations and chloroform anæsthesia, overexposure to the sun, or even typhoid inoculations.

Kaminer and Zondek(17) report having found parasites in the blood of apparently healthy persons. They say of these persons that at least they were free from fever, and complained of nothing worse than a little headache and a feeling of lassitude.

Of interest in this connection is the observation of Delanoe(6) in an epidemic of malaria in the Oulad Hassoun, Western Morocco. A remarkable feature of this outbreak was the early appearance of a large number of gametocytes in the blood of persons stricken with malaria. Similar phenomena have been recorded by other observers, which should serve as an indication that primary malaria must be strictly dealt with, especially in localities where conditions for transmission are favorable.

Malaria as a problem may be regarded from three distinct standpoints: First, there is that aspect of malaria that most frequently comes under the notice of the physician—the active manifestation of the disease, which may express itself in a more or less typical, clinical picture. There are the familiar benign and malignant tertian fevers, with exacerbations occurring about every forty-eight hours; the less frequently observed quartan fevers, with attacks every seventy-two hours; double tertians

and quotidians, giving rise to the daily attacks of ague; double quartans, mixed tertians and quartans, postponing and anticipating attacks; and the rest of the more or less bewildering series of clinical manifestations to which malaria may give rise, all of which are familiar to practitioners in the tropics. While the experienced man grows to regard with suspicion all pyrexial attacks, and to look for the unexpected picture in malaria, still, it is the part of wisdom to suspend judgment on any atypical case suspected to be malaria until the microscope confirms that suspicion. However, this phase of malaria will not be discussed in the present paper.

Secondly, there is the matter of relapses, which has a very vital bearing on the prevention of malaria among troops. It is impracticable to discuss the theoretical considerations of malarial relapses, for this would involve a discussion of the cytology and physiology of the organism.

Lastly, there is the problem presented by the carriers; that is to say, persons who are parasitized with *Plasmodium*, but show no apparent symptoms of the disease. These constitute the most dangerous group, and the group to which I shall devote the most attention.

The detection of infected, but apparently healthy, recruits and their separation from the healthy and uninfected recruits are matters that will severely tax the knowledge, skill, and resources of any army medical corps; yet this work must be thoroughly done, if the uninfected recruits and the neighboring troops at the front are to be protected against the menace of the carriers.

Once detected, there still remains the task of sterilizing the malarial carrier, and this may prove in some cases a task of almost equal difficulty.

It is not my purpose to outline here a course of procedure that might be followed by army medical authorities, for that is a matter that naturally lies wholly within their province and responsibility. I merely wish to set forth a few of the points of attack of which a protozoölogist might avail himself. These would be entirely aside from clinical data, such as pyrexia, splenic enlargement, and so forth. Under the heading of laboratory procedure we would have to consider:

1. FRESH AND STAINED BLOOD FILMS

The ordinary blood films are not to be relied upon for the detection of carriers. A long search may or may not reveal gametocytes or an occasional trophozoite, suspicious pigmentation of leucocytes or mononucleosis. To state it plainly, the

examination of such preparations with the expectation of discovering even a fair proportion of carriers amounts to a waste of time, pure and simple, unless the general blood picture, in the absence of parasites, yields the evidence of latent malaria.

The Ross thick-film method may be employed. This, in all probability, will yield a higher proportion of positives than the thin smears; still, many will be missed. Reliance must not be placed on this method, if it is desired to secure accurate results.

The differential leucocyte count may, in itself, be sufficient to place a man under suspicion as being a latent malarious subject. Fever and parasites may be absent; but if the blood shows a high percentage of mononuclear leucocytes or if there is occasionally a transient leucocytosis unaccompanied by fever, one may suspect malaria and place the subject under observation.

2. CONCENTRATION AND CULTURAL METHODS

There are several of these, all based in principle on the scheme underlying Bass's method of cultivating *Plasmodium*. The original procedure was devised by Bass and Johns(1) and involves a careful technic which, however, is not beyond the resources of the advanced student of medicine. Modifications have been devised by Row(27) and by J. G. and D. Thomson.(33) All of them are practical. In selected cases one may use the technic of Dudgeon and Clark,(9) although these authors point out that they have failed to secure results in infections with *Plasmodium vivax* of benign tertian fever. The method of Bass and Johns may probably be considered as the best for precise work.

3. PROVOCATIVE METHODS

By these are meant the employment of certain drugs, biological products, or the quartz lamp. Such measures have a tendency to force the parasites out of the spleen, bone marrow, and elsewhere, into the peripheral circulation, where they can be detected on the ordinary blood films and then be dealt with by the regular specific treatment.

James,(15) in an able paper, has reviewed the etiology of malarial relapses. Relapses, he says, almost invariably follow the so-called spontaneous cure of primary cases of malaria; that is, the cessation of symptoms without treatment. This is just the class of cases for which we must be very watchful in a body of men drawn from malarious tropical regions, for it is extremely likely that a large proportion of such men never received treatment for the malaria from which they have suffered. Infections insufficiently treated with small doses of quinine will,

James goes on to say, in all probability relapse. If prompt and vigorous treatment is instituted after the onset of an attack of malaria, relapses are less likely to occur; and, conversely, the later the primary attack is treated (even though the doses of quinine given were large and treatment continued for a long time), the more certainly will the symptoms recur.

James says, further, that occasionally relapses will occur when parasites are present in the blood and the patient has not stopped taking quinine. He also believes that the infection will, in time, die out, if reinfection is excluded and death does not take place. This, he adds, applies in the last analysis even to persons who are carriers, but who manifest no febrile symptoms though parasites may be found in the peripheral blood.

Under the first heading, the detection of carriers through the medium of blood films, but little need be added to what has already been said. The difficulties are pretty well understood by all laboratory workers. Macfie and Ingram(18) have called attention to a condition they encountered in West Africa that adds to the difficulty of identifying species of the parasite in blood films. These workers noted the rarity of crescents in the blood of peripheral subtertian infections they encountered in that field. This made necessary the identification of the parasite from the character of the trophozoites, a task that offers some difficulty to the inexperienced microscopist.

Of interest in connection with the examination of blood for malarial parasites is the question as to the number of parasites that are necessary to produce fever. Ross and Thomson(26) have made some studies on sporulating forms in the peripheral blood and give the following figures:

In benign tertian fever 100 adults per cubic millimeter of blood are necessary to produce a fever of 99° F., and 300 adults or more per cubic millimeter are necessary to produce a fever of 100° F., or over.

In malignant tertian fever 3,000 young rings per cubic millimeter of blood are necessary to cause a fever of 99° F., while from 5,000 to 300,000 young rings per cubic millimeter will give a fever ranging from 99° to 106° F.

This has led these authors to state that in a case of true malaria the microscopist is certain to find parasites if the blood is taken at the time of the paroxysm, except in those theoretical cases of malignant tertian fever when all the parasites are sporulating simultaneously. This is in line with the statement attributed to Ronald Ross by Dudgeon and Clark(9) as follows:

> But for a broad general rule we may, I think, accept the principle (pending more exact researches) that if we cannot find the parasites after careful search their number is not usually sufficient to produce fever.

This statement of Ross's, made in 1911, with the reserve characteristic of the careful scientist, will certainly not be safe to follow to-day in the handling of carriers, and it is questionable if it is to be strictly followed in the case of active malaria. The theoretical cases mentioned by Ross and Thomson, where malignant parasites mature simultaneously, are sufficiently common occasionally to trouble a microscopist who tries to find the trophozoites of *Plasmodium falciparum* during a febrile attack. In this connection it will be interesting to recall the statements of Garin and of Kaminer and Zondek I have already given. James,(15) too, has pointed out the difficulty of attacking the parasites in the parenchyma of the spleen and in the bone marrow with quinine. In this connection he cites cases in which patients dying from malaria showed no parasites in the peripheral blood, but did show a few in splenic smears, where of course the erythrocytes were much less abundant. He also noted that, in cases where the patient died after three to five days' treatment with quinine, the parasites were more frequently seen in the spleen and bone marrow when the quinine had been administered orally, less frequently when it had been administered by hypodermic injection, and least frequently when the quinine had been given in three to four doses of 22.5 grains intravenously. His explanation was that the parasites in the spleen and marrow escape the full effects of the quinine, so that when those in the peripheral circulation are killed some still remain in the spleen and marrow. When these multiply above a certain number, they appear in the peripheral circulation, and further multiplication there brings about a febrile relapse. While much of this does not have a direct bearing on the question of handling carriers, the general point might well be borne in mind.

As to concentration and cultural methods I can do little more than refer the reader to the original papers of the authors to whom I have already alluded. The methods in every case are too detailed and technical to make their presentation here practicable; but many of them are of great and undoubted aid in the detection of parasites in the blood when these are present in numbers too few to admit of discovery on the ordinary blood film except after long and painstaking search.

Some two years ago at a meeting of this society, I ventured to suggest to my medical colleagues the advisability of resorting

to the use of adrenalin for the purpose of dislodging malarial parasites from the internal organs and the fine capillaries. My suggestion passed without comment in the debate. Several other men have since thought of the same thing, have been able to carry it into execution, and have achieved results that, to say the least, are interesting in their bearing on the topic under discussion.

Neuschlosz(22) has very recently demonstrated that malarial parasites resting in the spleen parenchyma may be made to enter the peripheral circulation through the exhibition of substances believed by some to have the power of causing contraction of the spleen. It may be said in passing that it is yet to be shown that these drugs produce contraction of the spleen. He has used adrenalin, ergot, and extract of hypophysis. The reaction is accompanied by a typical paroxysm and fever, the parasites appearing in the blood from four to six hours after the injection. According to the observations of Neuschlosz, the parasites make their peripheral appearance more promptly after the administration of adrenalin than they do after extract of hypophysis has been given, but with the latter substance they remain in the circulation for a longer period of time.

Di Pace,(8) working on the same principle, has reported success following the administration of salts of berberin and of strychnine—preferably the nitrate.[5]

Mandoki and Maule(19) have used Coci's quinine method in the provocation of blood parasitosis in malaria and were able to detect latent malaria in 50 per cent of the cases thus treated. This test offers the objection, however, that it necessitates the exhibition of the quinine for four weeks.

Von Draga,(35) in a series of experiments, has succeeded in reviving latent malaria by the injection of sterilized milk. In 5 of his cases there was no reaction; in 13 there was an immediate rise of temperature followed, after an interval of ten to fourteen days, by fever and the appearance of the plasmodia in the blood. In 3 cases he found parasites in the blood, apart from the specific "milk-injection-fever."

[5] The experiments of Di Pace have recently been repeated by King [*Indian Journ. Med. Res.* (1918), 6, 116], who has failed to confirm the results of Di Pace. King states that strychnine, in most cases, does not bring about an increase in the number of parasites in the peripheral circulation. He concludes that the drug offers no aid in the routine diagnosis of latent malaria. As to the action of strychnine on the spleen, King states that in large doses it brings about a reduction in the size of large spleens, but has no effect on spleens that are only slightly enlarged.

Brauer(2) employed horse serum in his investigations at Skutari, Albania. In tropical malaria he witnessed an immediate increase in the number of schizonts and gametocytes. Injections of the serum brought out parasites he had been unable to detect in the blood in some cases, and he therefore employed the method in the detection of latent malaria. Supplementary to other treatment he employed injections of horse serum, followed in four hours by an intravenous injection of quinine. His use of milk as employed by von Draga was attended with less success.

Jarno,(16) on the other hand, reports having tried Brauer's subcutaneous injections of horse serum in 37 cases of malaria, without success. He says nothing about its applicability to the detection of carriers.

Muller(21) adds to these provocative methods the irradiation of the spleen with the quartz lamp.

Reinhard(25) holds that in latent malaria quinine fails, because the parasites are not in the general circulation. Therefore, except in relapses, they are inaccessible to quinine treatment unless first carried into the peripheral circulation. As to the cause of relapses, he ascribes them to a purely mechanical factor—the influence of the blood pressure which on elevation would tend to sweep the parasite out of the sinuses and capillaries and into the circulation. This, to say the least, seems quite logical; but at the same time it would seem that other causes as well might bring about the relapses. J. G. Thomson,(32) in a careful analysis, has finally disposed of Schaudinn's anomalous theory of the parthenogenesis of the macrogametocyte. It has long been my belief,(13) first expressed in 1914, that malarial relapses might be induced by a transient hyperglycemia. Evidence I have since gathered has strengthened that belief and indicates confirmation of the early views of Bass and his coworkers on the influence of blood sugar on the clinical course of malaria. Strikingly suggestive data along these lines has recently been published by de Langen and Schut[6] in their work on tropical acclimatization.

Reinhard quotes Bach as having shown that irradiation of the spleen with the ultra-violet quartz lamp will bring the parasites into the circulation. Quinine is then given. He adds that still better results than those he cites are obtained by the use of the "aureole lamp" of Siemens and Halske.

Finally, in connection with the general problem of examination

[6] *Nederl. Tijdschr. voor Geneesk.* (1918), 1, 336.

of the blood and detection of latent cases, reference should be made to the work of Meyerstein(20) in connection with the Wassermann reaction on malarious subjects. He has shown that the Wassermann reaction is frequently positive in tertian malaria during the first days following access of fever. This particularly applies with the ethereal heart extract of Lesser. A positive reaction is seldom obtained after the tenth day, particularly in intractable cases with a tendency to relapse.

Meyerstein holds that the reaction depends on, but does not completely coincide with, the presence of malaria parasites in the blood. He found that the Wassermann reaction dissappeared simultaneously with the parasites under the influence of quinine and also in two cases treated with neosalvarsan. The conclusions he draws are: That it is unlikely that the disappearance of the Wassermann reaction during the treatment of a case of malaria signifies a final cure; and that, on the other hand, cases of malaria that—apart from any question of syphilis—give a positive Wassermann reaction must be considered as requiring further treatment.

The outlining of a method of systematic examination of military recruits along the lines laid down in this paper naturally presupposes a comparative study of the work of the several men cited, and the provisional scheme that follows is only put forward as a suggestion of a general method which might, however, be considerably modified with experience. It is taken for granted that all recruits will receive a thorough physical examination and that this, in the natural course of events, would include an inquiry into the previous history of malaria; palpation of the spleen, bearing in mind the tropical splenomegalies of unknown etiology, anæmia, jaundice, cachexia, and the like.

The laboratory examination of the recruits might profitably be taken up in three stages as follows:

FIRST STAGE

One Ross film and one or two thin blood smears from each recruit. The thick film is to be used for the detection of the presence of parasites, and the thin films for the identification of species, if the thick film does not yield that information through the presence of crescents; these slides to be taken on two successive days, the morning of the first day, and the late afternoon or evening of the second day if the first specimen is negative. A careful differential leucocyte count should be made

in each case with a view to detecting any mononucleosis. All positives discovered by this test are to be sent to the hospital for treatment; the cases reported negative by the examiners to be passed on to the

SECOND STAGE

This involves the utilization of the provocative methods of the first group I have described; namely, adrenalin, hypophysial extract, ergot, strychnine,[7] berberin, quinine.

The choice would naturally depend on a study of the comparative action of the various drugs or upon the individual taste of the military medical officer coöperating in the work.[8]

Positives detected at this stage would be sent to the hospital for treatment, and the negative cases would thereupon pass on to the

THIRD STAGE

Here would be used the biological reagents of the second group; namely, milk, horse serum, the quartz lamp.

Positives finally detected here would, of course, go to the hospital for treatment. The negatives, however, should be kept under medical surveillance for a definite period and watched particularly for symptoms following periods of severe physical exertion, muscular fatigue, or exposure.

In this paper it is not my purpose to go into the matter of the treatment of malaria. It seems desirable, however, to call attention to a recent very important contribution to malariology.

Skinner and Carson,(29) working in India in 1911, conceived the idea that irradiation of the spleen by the Roentgen rays might bring about the destruction of malarial parasites lying within the substance of that organ. The authors experimented on eleven cases of malaria, some of them very serious, accompanied by splenomegaly, and in some cases running a temperature of more than 104° F. Some of the cases were admitted to the hospital in collapse. These patients were treated by three- to five-minute exposures to the Roentgen rays.

[7] See footnote 5, p. 300.

[8] I have recently undertaken a series of studies on the action of these and other drugs, especially with a view to determining, among other things, their effect on the sugar content of the blood. The work is being undertaken in collaboration with some of my colleagues and will include a clinical and pharmacological as well as a protozoölogical study of the action of the drugs. It is hoped that a preliminary paper may be pubished in the near future.

In every case splenic pain was relieved, and the engorged spleen reduced. The temperature fell and did not usually rise again; when it did rise, further treatment of the same nature brought it down permanently. Recovery, they reported, was not attended by the anæmia usually present in cases treated with quinine. In no case did the authors fall back upon quinine in cases treated by the Roentgen rays, while they successfully treated cases that had shown no cure on the administration of quinine.

Medical history repeats itself. The work of Skinner and Carson seems to have been practically forgotten for several years, for a search of the literature available to me has resulted in the discovery of no further work along this line until the papers of Pais and of Deutsch published last year, which I have recently seen in abstract.

Pais(23) has reported on fifty patients treated by spleen irradiation. His success seems to have been not quite so brilliant as that of Skinner and Carson, but he seems to have been successful in arresting the disease in nearly all cases, and to have brought about a reduction of the spleen to its normal outlines. He states that small doses in a first attack attenuate the disease; larger doses appear to change the cycle of the fever. In his experience new generations of parasites appear to display exalted virulence under the influence of the rays. In connection with chronic cases that have failed to improve under quinine, he states there may be complete recovery under the influence of the Roentgen rays, or at least the infection may be so modified that quinine will work a cure.

Deutsch(7) employed deep irradiation of the spleen in 27 cases. Of these 17 were malignant, and the other 10 benign, tertian fever. In almost all there was speedy reduction of the spleen, irrespective of other results. Of the 10 benign tertian cases, 7 were reported as free from fever and gametocytes for a period of six months and were therefore regarded as cured.

The effect of the treatment became apparent, as a rule, after the first application of the rays, when the relapse next due failed to appear. Of the 3 cases that were not benefited, 2 were used in the preliminary experiments and were given treatment with a lower dosage; the other had failed to yield to quinine treatment.

Of the 17 subtertian cases 9 were apparently uninfluenced by the treatment; in 4 others the attacks ceased for a month, and in the other 4 parasites were absent from the blood and there

was no fever over a period of several months. All of these 17 cases had been unsuccessfully treated with quinine and salvarsan.

Just a word in conclusion regarding quinine and the question of quinine-fast parasites. The facts regarding arsenic-fast trypanosomes are fairly familiar, but there is much doubt as to whether or not strains of quinine-fast plasmodia develop following the prolonged use of quinine.

James(15) in 1913 stated his belief that the malarial parasite develops some resistance to quinine, and since then several other workers have expressed the same belief.

Teichmann(30) has made an interesting series of clinical and experimental studies on quinine habituation and the apparent quinine-fastness of *Plasmodium*. Working in a German military hospital in Turkey, he noted the apparent failure of quinine as a prophylactic for malaria in certain cases of both benign and subtertian fever. He found that patients who had not taken quinine previously responded readily to the regular treatment. On the other hand in those who had taken quinine regularly the parasites appeared as soon as the quinine was withdrawn or even persisted during its administration. He has reviewed the usual explanations for this condition, but notes that many patients were suffering from dysentery and enteritis, so that the quinine was incompletely absorbed. He ascribes much of the trouble to quinine habituation of the body leading to a reduction in, or even disappearance of, the specific action of the drug, and he gives some interesting experimental data in connection with that contention.

He concludes that a certain concentration of quinine in the blood is necessary before the drug will exert its specific action. In quinine habitues smaller and smaller quantities of quinine are there; the quinine-fastness of the parasites is therefore only apparent. The plasmodia are still sensitive to it, but the quinine is not present in sufficient amount to kill them. He therefore gives the quinine intermittently. Teichmann states that he is not opposed to the employment of quinine as a prophylactic; he urges its systematic but careful use. If malaria does develop in spite of the prophylaxis, he advises treatment by the administration of quinine in intermittent and rising doses.

On the other hand, Giemsa and Halberkam,(11) reviewing the work along this line, state that they have not been able to confirm the contention of Teichmann, and also that of Neuschlosz, that elimination of the drug is different in those accustomed to quinine than in those who have not been used to taking it.

The results of Russell,(28) who also experimented with intermittent quinine, resemble those of Teichmann. In repudiating the quinine-fast theory, he states his belief that in apparent quinine-fastness of the parasites the trouble is traceable to imperfect absorption of the drug. He remedies this by combining the quinine with iron and strychnine or capsicum and ginger, which combinations in his hands brought about a cessation of the relapses.

But, nevertheless, judging from the behavior of protozoa of this type under adverse environmental conditions, there is biological soundness in the following statement of David Thomson:(31)

> Since crescents or gametes (sexual parasites) are the agents which infect mosquitoes, thereby propagating and spreading the disease, it is of extreme importance to rid the blood of them. Small doses of quinine encourage their production and intermittent large doses have the same effect. I hold, therefore, that except in unusual circumstances clinicians who adhere to treatment in small doses, or who give large doses (thirty grains daily) intermittently are doubly guilty of malpractice, and that patients who refuse to undergo a thorough course of treatment are not only foolish to themselves, but are in addition a danger to a tropical community infested with mosquitoes.

To this I may add that our present knowledge regarding gamete carriers should teach us that ridding the blood of gametocytes effectively involves prolonged treatment directed against their progenitors, the trophozoites. I have no knowledge of the length of time a gametocyte may live, as such, in the circulation. The microgametocytes have little to fall back upon during this period in the life cycle of the organism, when food-taking would seem to be impossible, and they probably perish very quickly. The macrogametocytes contain a certain store of food substance which becomes available during sporogony; and, even if this is convertible into energy during life in the blood, there is a limit to it, and once exhausted it would seem that the cell would quickly die. Therefore, the persistence of gametocytes in the blood of a malarial convalescent would appear to be evidence of the presence, somewhere within the host organism, of the asexual forms that are continuously developing into the sexual forms.

Ross's conclusions regarding the efficacy of tartar emetic in the elimination of crescents seem not to be borne out by later work; and, until more proof of its efficiency in this direction is brought forward, we must, in the work of sterilizing carriers,

continue to repose faith in active treatment directed against the trophozoites.

SUMMARY

1. The recruiting of large bodies of men destined to form army units, from areas in tropical countries where malaria is known to be endemic or epidemic, is certain to bring together many men who, apparently healthy, are yet carriers of the malarial parasite and are capable of conveying it to healthy persons. It likewise imposes a heavy responsibility upon the medical staff of any military organization so obtaining its recruits.

2. These carriers, in the presence of anopheline mosquitoes, are a source of peril to any community that is comparatively free from the malarial fevers. They are likewise a peril in their own garrison, and great care should be exercised in the selection of a site on which to establish a training camp.

3. Such men, on undergoing the heavy work of military training, with its attendant fatigue and exposure, are extremely likely to develop the disease in its active form with the consequence that the effective strength of their unit will be reduced.

4. At the front, in a foreign country where antimosquito measures may be impracticable and quinine prophylaxis fraught with difficulties, these carriers are a source of peril to all neighboring troops, especially as they may be the bearers to the troops of other nations of new and virulent strains of the parasites.

5. Carriers should be sought out with care. No reliance should be placed on the simple examination of blood films; some will be detected by this method, but many will escape detection. Use should be made of concentration or cultural methods, supplemented in the negative cases by provocative methods that will tend to awaken the latent infections and bring the parasites into the peripheral circulation, where they can be destroyed by the usual specific treatment.

6. In the event of quinine failing to act, investigation should be made to see if the drug is being absorbed and turned into the blood stream in sufficient volume to bring about the destruction of the organism. If the drug is not being utilized by the patient, either the condition should be corrected by the use of adjuvants or some other form of treatment should be instituted.

7. If all of these measures fail, the recruit should be honorably discharged from the service.

8. The surgical importance of malaria in connection with wounds and operative procedure should likewise be well borne in mind by the surgical staff. The tendency of latent malaria to become active under the influence of wounds, surgical procedure, and anæsthesia is well established by several observers.

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A STUDY OF THE CALCIUM GLANDS IN THE COMMON PHILIPPINE HOUSE LIZARD [1]

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TWO PLATES

A calcium deposit in the region of the neck posterior to the opening of the external auditory meatus was noted in many snakes, frogs, and lizards and described by Wiedersheim (3) many years ago. He says in part:

Auf deren Nervenendstelle ruht eine dünne Membrana tectoria von Hufeisenform, und darüber findet sich eine Kleine Aussammlung von Otolithen.

Der bei Fischen und Amphibien auf manchen Excursionen angetroffene Ductus Endolymphaticus hat jene auch bei den Reptilien noch nicht eingestellt und das bei vielen bis unter das Schadeldach reichende Ende stellt bei Embryonen von Eidechsen und auch von Schlangen bei Kalkkrystalle führendes Säckchen vor, welches, weis durch die Haut schimmernd, mit blosem Auge erkannt wird. Bei Ascalaboten geht von daher eine weitere Entfaltung aus. Das Säckchen tritt an der Parieto-occipitalnaht durch diese um sich subcutan zwischen der Musculatur des Nakkens, zum Theil auch des Schultergürtels, als vielfach gebuchteter Schlauch zu vertheilen, bis zum Pharynx und der ventralen Seite der Halswirbelsäule herab. Eine weiche Otolithenmasse erfüllt ihn.

The functional activity of this gland seems, however, to have been entirely neglected, and no observations have been recorded. Boulenger (1) noticed this gland, but believed, with Sauvage, that it was a pathological condition. He states:

From New Caledonia I have examined one specimen, presented by M. Delacour to the Paris Museum, and described by Dr. Sauvage as *Lepidodactylus crepuscularis*, Bavay. One of the characters pointed out by Dr. Sauvage as distinguishing the supposed latter species from *L. lugubris*, viz. the presence of a large gland on each side of the neck, is an individual (apparently pathological) character, and occurs in many species of the Geckonidæ.

Stejneger (2) also describes this calcium deposit on the lateral side of the neck as follows:

On each side of the neck behind the ear opening there may be seen in many geckos a more or less enlarged oblong swelling which, in large

[1] Received for publication May 2, 1918.

specimens, often assumes great dimensions—equalling one-half the size of the skull. This sac is filled with calcareous matter, which is connected with the ear by ducts or canals. Professor Wiedersheim, who was the first to describe this organ in detail, considers it an auxiliary to the auditory apparatus, having as its object the perfecting of the sense of hearing in the animals. These calcareous masses are popularly, but erroneously, believed to be the undeveloped eggs which the females are supposed to carry about in a sort of pouch until they are deposited in some safe place for hatching.

While severing the spinal cord in the region of the medulla, I was attracted by a grayish white substance that oozed from the region of the neck. This substance soon became hard on exposure to the air. This gland containing the milky substance was constant in two species of the pregnant house lizards. Under the microscope this milky substance was seen to be of an amorphous nature when fresh, but on exposure to the air small crystals were formed. In all probability these were crystals of calcium carbonate. At first it was believed that this calcium gland was present only in pregnant lizards and that it probably bore a definite relation to the formation of the calcium shell about the egg substance. However, the gland is present both in the male and in the female, but there is an increased functional activity during pregnancy.

I am indebted to Mr. E. H. Taylor, of the Bureau of Science, for the proper classification of the Philippine house lizards, for much material given me, and for many specimens that were loaned to me, for all of which I wish to express my appreciation.

There are four common Philippine house lizards found in Manila: *Cosmybotus platyurus*, *Hemidactylus frenatus*, *Peropus mutilatus*, and *Hemidactylus luzonensis*. The calcium gland is found in only two of the above-named species, *Cosmybotus platyurus* and *Peropus mutilatus*. In *Hemidactylus frenatus* and *H. luzonensis* no calcium is stored in the gland in the region of the neck. However, in these two species a spongy reticulum is found in the region of the neck, which will be described more in detail in a subsequent paragraph. All four species are ovoviviparous, the embryo developing to a length of more than 1 millimeter before the egg is laid.

The calcium glands are found, one on each side of the neck, lying immediately behind the opening of the external auditory meatus. They are slightly oblong, the greatest diameter being in an anteroposterior direction. Their position is semicircular, the extremities reaching the anterior and posterior sides of the neck (Plate II, fig. 1). The gland in the pregnant *Cosmybotus platyurus* is much the largest, having an average anteroposterior

diameter of 8.3 millimeters on the right side, while the gland on the left side has an average length of 7.3 millimeters. The average lateral diameter was 6.3 millimeters. The calcium glands of pregnant individuals of *Peropus mutilatus* are somewhat smaller, having an anteroposterior diameter of 5.4 millimeters and a lateral diameter of 4.2 millimeters. In all pregnant lizards where the egg substance was almost ready to receive its calcium shell the gland was always found engorged with calcium milk. In several instances after the shell had been completely formed and the eggs were ready to be laid the calcium gland was found to be practically devoid of its calcium content. When the gland is engorged with calcium milk, small, filled canaliculi are seen to communicate with the occipitoparietal sinus, which also is filled with this milky fluid. The females in which the eggs were not developed showed the same type of gland as found in the male. All male lizards of this species that were examined contained only a comparatively small amount of calcium in the gland, while in a number there was no calcium deposit whatever. In no instance was the gland found enlarged and engorged as it was in the pregnant lizards. The average anteroposterior diameter of the calcium gland in the male specimens was 4 millimeters, while the lateral diameter was 3 millimeters. It is plainly evident that the functional activity of the calcium gland is greatly increased during the period when the calcium is secreted to form the shell about the egg substances.

In *Peropus mutilatus* the gland is somewhat smaller than in *Cosmybotus platyurus*. However, the same general conditions obtain in this species as in *Cosmybotus*. The gland in the pregnant lizard is always large and is filled with amorphous calcium. In the male the gland, in a large proportion of specimens, contained no calcium deposit whatever.

In both species the gland, when engorged, can be easily seen lying underneath the skin. In *Cosmybotus platyurus* the gland lies somewhat more superficially than in *Peropus mutilatus*. When an effort is made to remove the skin of *Cosmybotus*, it sometimes adheres firmly to the gland, so that the latter is broken. In *Peropus* the gland lies more deeply—well below the superficial fascia, and therefore the overlying skin and the gland never adhere to each other. In both species the gland is well surrounded by voluntary muscle fibers.

The calcium glands were also studied in a large series of the gecko (*Gekko gecko*), which is a species of lizard very much larger than the house lizard. In all the females, many of which were pregnant, a calcium deposit was present in the gland. In

twenty of the male specimens studied a calcium deposit was found in only four, while in the remaining number there was a complete absence of the calcium. Here, again, is the striking difference in the functional activity of the gland in the pregnant, the nonpregnant, and the male lizards.

Taylor, in an unpublished observation, has also seen a calcium deposit in many of the young lizards after hatching.

The calcium gland in *Cosmybotus platyurus* and *Peropus mutilatus* are histologically identical. Under low-magnifying power the gland is distinctly lobulated, with a pattern much like the external surface of a mammalian lung. There is no distinct capsule, and the external wall is surrounded by a loose connective tissue reticulum. From the external wall trabeculæ extend into the gland, dividing it into follicles. Each follicle is lined with a single layer of large cuboidal epithelial cells that lie on a basement membrane. The connective tissue intervening between follicles is extremely loose in texture. Between the adjacent walls of the follicles is a rich capillary network. In the active gland the follicle is filled with an amorphous substance into which the cells have wandered. The cells that lie near the epithelial wall retain their cellular characteristics distinctly. As they wander farther out into the center of the follicle, they become more and more disintegrated. Whether or not these cells take an active part in the production of the amorphous calcium is not definitely known, although it seems probable that they do play some rôle in the formation of calcium by the gland. The peripheral follicles are, as a rule, smaller than those placed more centrally. Voluntary, or striped, muscles often extend with the trabeculæ into the medullary portion of the gland.

In *Hemidactylus frenatus* and *H. luzonensis* the gland is composed of a reticular structure forming numerous small follicles, which have never been found to contain a deposit of calcium. However, in the pregnant lizards a calcium milk is found filling the sinuses on the superior and medial sides of the orbital cavity as well as the sinus in the region of the occipitoparietal suture.

SUMMARY AND CONCLUSIONS

The calcium gland in the region of the neck of the common house lizard is undoubtedly an auxiliary to the auditory organ, inasmuch as it supplies a calcium salt for the formation of the otoliths of the ear.

In pregnant lizards the calcium gland is thrown into a greater functional activity, which immediately decreases when the calcium shell about the egg substance is formed.

According to Wiedersheim the calcium gland is an auxiliary to the auditory apparatus. On the one hand, it may be possible that this gland, during pregnancy, becomes more active, thus increasing the keenness of the auditory sense rendered necessary at that time for the protection of the parent and her progeny. On the other hand, there is evidence to show that the calcium gland prepares the calcium salt that is carried by the blood stream to the oviduct, where it is deposited as the shell surrounding the egg substance.

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ILLUSTRATIONS

PLATE I

From left to right, lizards 1 and 2, *Hemidactylus frenatus*, male and female, showing a complete absence of calcium deposit in the gland. In No. 2, the calcium shell completely covers the egg substance. Lizards 3 and 4, dorsal view, are *Cosmybotus platyurus*, pregnant females, showing large engorged calcium gland on each side of the neck. The last two illustrations show ventral views of lizards 3 and 4, illustrating the extent of the calcium gland on the ventral side of the neck. The eggs are almost fully developed in 3 and 4, and are ready to receive the surrounding deposit of calcium to form the shell.

PLATE II

[Drawings by V. de los Santos.]

FIG. 1. Low-power drawing of calcium gland, showing follicles containing an amorphous calcium deposit. ×140.

2. High-power drawing, showing cells wandering into the amorphous calcium deposit in the follicle. ×670.

PLATE I.

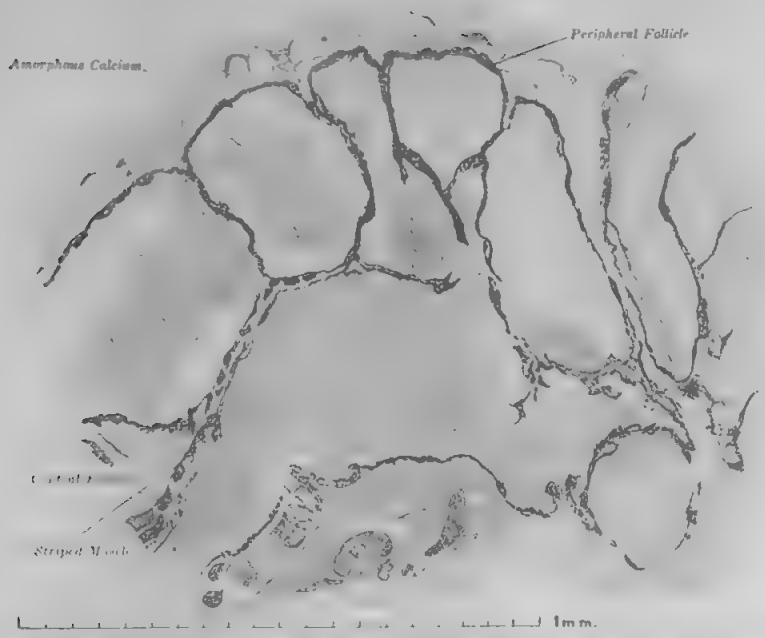

Fig. 1. Low-power drawing of calcium and gland, showing follicles containing an amorphous calcium deposit. × 140.

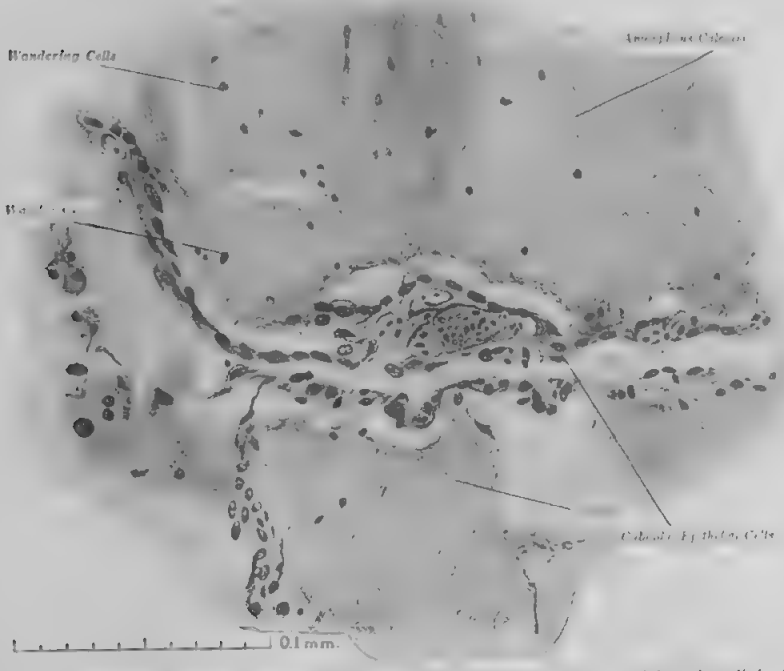

Fig. 2. High-power drawing, showing cells wandering into the amorphous calcium deposit in the follicle. × 670.

PLATE II.

A STUDY OF ONE HUNDRED THIRTY-FIVE HUMAN EMBRYOS AND FŒTUSES COLLECTED IN THE PHILIPPINE ISLANDS [1]

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The human embryos figured in this publication were all secured in the Philippine Islands, most of them from Manila and a few from the surrounding provinces. Several of the specimens are of European parentage and are so indicated; all others are Filipinos, belonging to the Malayan race. Beyer (2) divides the Filipino people (exclusive of the Negritos) into four fundamental types: Short and tall Mongol, Primitive Caucasian, and Indonesian. It will be of interest to see whether a numerical index can be prepared to determine these types in the early stages of development.

The splendid embryological collection that is rapidly growing has been made possible only by the coöperation that is being received from the physicians and surgeons of the Philippine Islands. I take this opportunity to thank all the physicians who have generously donated material to promote the science of embryology in the Philippine Islands. In the period of three years almost one hundred fifty specimens have been collected. Much is yet to be accomplished in the field of embryology, and it is hoped that many more of the earlier stages of the developing human embryo may be secured.

The measurements of all specimens were taken immediately after reaching our laboratory. The embryos are, as a rule, sent to us in a fixing fluid, the larger ones in 10 per cent formalin, the younger ones in Bouin's fluid.

The crown-rump and standing-height measurements are taken according to Mall's method. All the smaller specimens are weighed after being in the preserving fluid for some time, while some of the larger fœtuses are weighed in the fresh state.

The menstrual age was obtained only in a limited number of cases, and no definite conclusions can be drawn at this time as to the size of the embryo for a definite age. However, there seems to be a parallelism between the length of the Filipino

[1] Received for publication May 9, 1918.

and European embryos for a given age in the several cases for which data are at hand. Much more information must be accumulated before any definite statement along this line is justified. Albert and Arvisu(1) have taken a large series of measurements on Filipino children from 6 to 36 months of age. A comparison of the height of Filipino and a series of American children measured and reported by Grover(4) is almost identical up to the tenth month. In fact, a comparison of the two tables shows that during the seventh or eighth month of life the Filipino children have a greater length than American children. The weight of Filipino children is invariably greater than in American children of the corresponding age after the sixth month. After the tenth month the difference in size between American and Filipino children at once becomes apparent. Whether this difference is due to an environmental cause or a hereditary influence has not yet been determined. Undoubtedly heredity plays a very important rôle, but other causes and influences should not be overlooked. Gibson and Concepcion,(3) in a series of five puppies fed on cows' milk, found that growth stopped in four of the animals when 44 days old. Following the administration of an efficient vermifuge there resulted the passage of many ascarids. Growth was immediately reëstablished. The growth charts of these dogs are published in connection with another problem. This points out the importance of considering influences that undoubtedly have a bearing on the growth rate of an individual. That the Filipino is shorter in stature is a well-known fact, but the explanation for this has not yet been satisfactorily determined.

It will be necessary to study a large series of specimens in order more thoroughly to understand the causes that bring about miscarriages, abortions, and premature births. Mall(5) was the first to show this importance, and his contribution marks the beginning of investigations in this new field. Experimental teratology in the last two decades has done much toward explaining the formation of many of the pathological specimens and monstrosities. As the physicochemical laws of life are studied more and more, the laws governing the formation and development of monstrosities will be made more comprehensive. The production of cyclopes by the experimental work of Stockard(8) and of Werber(9) is one of the first decisive steps along this line. Our conception of the formation of certain types of monsters, especially the cyclopes, has been made clearer by the work of Stockard. He found that by treating fish embryos with a mixture of sea water and magnesium chloride over 50 per cent

of the fertilized ova would develop into cyclopes, or one-eyed monsters. Werber obtained similar results by treating fish eggs with very dilute solutions containing acetone and butiric acid.

Table I shows a complete list of the embryos collected in the Philippine Islands. All measurements are computed in millimeters. The crown-rump measurement is taken with calipers from the vertex of the head to the most distal region of the buttocks. The standing height, according to Mall,(6) is the crown-rump plus the thigh and leg length. The thigh length is taken by describing an arc about the head of the femur, representing the distance from the head of the femur to the tip of the buttocks. The distance from the described arc on the thigh to the knee joint represents the length of the thigh below the buttocks. This is necessary, as otherwise the distance from the head of the femur to the described arc, which represents the distance from the head of the femur to the distal tip of the buttocks, would be duplicated, if the embryo is measured when body and lower extremities are placed in a straight line.

The measurements of the chorionic sac were taken in three dimensions. The weight of the embryos is taken in grams. Only a few of the smaller ones were weighed in the fresh state; all others were taken after having been in a fixing fluid for some time. In the terminology of the pathological specimens an attempt is made to use terms that indicate to which group the embryo belongs as adopted by Mall,(7) who divided his pathological specimens into seven groups. This is especially adaptable for the first four groups, in which no embryo is present. A brief history of the mother is given, her age, number of pregnancies, full-term pregnancies, and abortions. The menstrual age is reckoned from the first day of the last menstrual period to the date of abortion.

As stated in Table I, out of 266 pregnancies, 183, or 64.4 per cent, were full-term births; 75, or 28.6 per cent, abortions; and 8, or 3.0 per cent, ectopic. The percentage of abortions in my series is a great deal higher than Mall reports, who found approximately 80 full-term births to every 20 abortions. In this series there are approximately 70 full-term births to every 30 abortions. The percentage here will be probably reduced when a larger series of cases is collected. The causes of abortion here are probably due in a large proportion of cases to general systemic diseases, such as beriberi, and other tropical diseases. Certainly a comparatively few, if any, are self-induced. Venereal disease is also almost unknown here, especially among the laboring class. There is, however, a great deal of endometritis

TABLE I.—*Showing complete list of human embryos collected in the Philippine Islands.*

Catalogue No.	Crown rump dimension.	Standing height dimension.	Chorionic sac dimension.	Weight of embryo.	Sex.	Normal or pathological specimen.	Nationality.	Age of mother.	Number of pregnancy.	Full term.	Abortion.	Ectopic pregnancy.	Menstrual age.	Type of pregnancy.	Physician donating specimen.
	mm.	*mm.*	*mm.*	*gms.*									*Days.*		
117	.....	.....	14×12×7	.....	.....	Chorionic sac	[a] F	.....	.....	.....	.....	.....	.....	Uterine	E. Perez.
115	.....	.....	17×16×7	.....	.....	Chorion and amnion	F	.....	.....	.....	.....	.....	.....	do	Mañalang.
48	.....	.....	18×15×10	.....	.....	do	F	37	12	7	5	.....	88	do	R. Molina.
135	.....	.....	30×18×22	.....	.....	Umbilical stump	F	.....	.....	.....	.....	.....	.....	do	R. Lopez.
121	.....	.....	35×25	.....	.....	Chorionic villi	F	27	3	2	0	1	35	Right tubal	P. Guazon.
134	.....	.....	40×22×18	.....	.....	Nodule	F	24	1	0	1	.....	65	Uterine	B. Valdez.
23	.....	.....	49×37×25	.....	.....	Two amniotic sacs and chorion.	F	25	7	5	2	.....	99	do	B. C. Crowell.
133	.....	.....	50×35×20	.....	.....	Chorion sac	F	.....	.....	.....	.....	.....	? 90	do	A. Gutierrez.
129	.....	.....	53×38×20	.....	.....	Vesicle of cord	F	.....	.....	.....	.....	.....	? 90	do	J. E. Reed.
123	.....	.....	63×46×22	.....	.....	Chorion and amnion	F	.....	.....	.....	.....	.....	? 90	do	De los Angeles.
27	.....	.....	71×54×25	.....	.....	do	F	25	2	1	1	.....	79	do	V. Reyes.
124	.....	.....	.....	.....	.....	Hydatidiform mole	F	20	2	0	2	.....	78	do	V. Magno.
131	.....	.....	.....	.....	.....	Chorion and amnion	[b] E	.....	.....	.....	.....	.....	? 90	do	J. E. Reed.
132	.....	.....	.....	.....	.....	.....	F	.....	.....	.....	.....	.....	.....	do	A. Gutierrez.
122	.....	.....	.....	.....	.....	Chorionic villi and sac	F	28	.....	.....	.....	.....	.....	Left tubal	P. Guazon.
125	.....	.....	.....	.....	.....	Scattered chorionic villi	F	35	7	5	1	1	.....	do	Do.
126	.....	.....	.....	.....	.....	Chorionic villi	F	45	5	4	0	1	.....	Right tubal	Do.
127	.....	.....	.....	.....	.....	Chorionic villi and sac	F	21	2	1	0	1	.....	Left tubal	G. Santos.
128	.....	.....	.....	.....	.....	.....	F	32	.....	.....	.....	.....	.....	Right tubal	P. Guazon.
130	.....	.....	.....	.....	.....	Degenerated chorionic villi.	F	30	8	6	1	1	.....	Tubal	Reyes.
96	1.43	.....	31×18.5×8	.....	.....	Vesicular nodule	F	25	.....	.....	.....	.....	.....	Uterine	De Leon.
32	1.5	.....	25×22×14	.....	.....	do	F	28	8	7	1	.....	.....	do	V. Reyes.
8	2.6	.....	33×22.5	.....	.....	Cyst of umbilical cord	F	28	7	5	2	.....	.....	do	E. Perez.
	2.6	.....	45×33.5×22	.....	.....	Anencephalia	F	35	.....	.....	.....	.....	.....	Tubal	Vincent.

20	8.6		13×10.5×7.5			Normal								Uterine	
114	8.65		14×12×8			do	F	26						Tubal	Mañalang.
15	4.13		68×23			Spina bifida	F	36	1	0	1			Uterine	A. Reyes
21	6.5			0.060		Anencephalia	F	19	5	3	1	1		Tubal	Santos.
33	6.5					Cystic tail	F	25						do	Calderon.
1	8		65×40×25			Atrophic	F	28	6	5	1			Uterine	Gilman.
5	8.5		85×63×35	0.060		do								do	Guazon.
52	10					Normal	E	24	4	2	2		42	do	Reed.
95	10		32×22×15	0.35		Anencephalia	F	37	1	0	1			do	Castañeda.
111	10		12.5×13×8	0.147		Back of embryo attached to amniotic sac.	F							do	Nolasco.
41	14			0.450		Normal	F	22						Tubal	Guazon.
43	15					do	F							Uterine	
40	157					Macerated	F							do	Gonzales.
118	16		51×43×25	0.350		Anencephalia	F	42	11	7	4		51	do	Guerrero.
113	16		47×35×15	0.297		Atrophic head	F							do	Yabini.
45	17.2			0.45		Normal	F							do	Garcia.
18	17.5	18.5	28×22×16	0.300		do	F							Tubal	Velarde.
29	18.5	18.5	40×30×15	0.550		do	E	35	3	2	1			Uterine	Gilman.
112	21		61×48×15	0.550		Fœtus compressus	F							do	Nolasco.
19	24	30		1.1		Normal	F	25						do	Manlove.
36	24.7	27.7	63×43×23	1.3		do	F	36	5	4	1		72	do	Reed.
39	26	30		1.9		Hydrocephalus	F	30	3	2	1			do	Guazon.
97	29	36		1.950		Normal	F							do	Perez.
42	32.3	41.5		2.150		Exomphaly	E	33	4	1	2	1	52	Right tubal	Guazon.
101	32.3	44.8	60×30×17	0.95		Partial cyclopia	F	20	2	1	1		81	Uterine	Lemmon.
44	40.5	52		4.2		Club hands and feet	F							do	
83	40.6	54				Normal, cleared	F							do	
16	43.5	56		4.7		Amniotic bands attached to fingers.	F	20	5	4	0	1	90	Right tubal	Guazon.
94	45.5	60		4.7		Normal	F	29	8	4	4		89	Uterine	Ocampo.
98	47	66.5		8.10		do	F							do	Perez.
59	51			6.90		Club hands and feet	F							do	

[a] F, Filipino.

[b] E, European.

TABLE I.—*Showing complete list of human embryos collected in the Philippine Islands*—Continued.

Catalogue No.	Crown rump dimension.	Standing height dimension.	Chorionic sac dimension.	Weight of embryo.	Sex.	Normal or pathological specimen.	Nationality.	Age of mother.	Number of pregnancy.	Full term.	Abortion.	Ectopic pregnancy.	Menstrual age.	Type of pregnancy.	Physician donating specimen.
	mm.	*mm.*	*mm.*	*gms.*									*Days.*		
4	53	75	70×29.5×25	8	? ♀	Normal	F	24	7	3	4			Uterine	Calderon.
46	53	80			♀	do	F							do	H. Sison.
84	54	79				Normal, cleared								do	
26	55	72		7.3	♀	Normal								do	
58	55	79		4.60		Club hands and feet								do	
80	59	76		8.2	♂	Hernia of liver	F	27	4	3	1		93	do	Angeles.
51	66	98	55×47×43	20	♂	Club extremities macerated.	F							do	Calderon.
2	66	93		29	♂	Normal	F	27	5	4	1			do	Guazon.
74	67	100		15.2	♀	do	F	28	10	9	1		? 97	do	Calderon.
9	68	99		27.8	♂	do	F							do	
116	73	99		13.81	♀	Slight clubbing of extremities.	F							do	Cabarrus.
25	73	103		24	♂	Normal								do	
65	79	113		37	♂	Amniotic band constricting neck.								do	
78	87	126		50	♂	Normal								do	
99	87.5	124		28.7	♂	do	F							do	Perez.
17	88	128		38.4	♀	do	E							do	Smith.
49	90	129		45	♂	do	F	19	3	2	1		73	do	Acosta Sison.
100	92	136		49	♂	do	F							do	Perez.
105	95	144		45.5	♀	Umbilical hernia	F	28	3	2	1			do	Lemmon.
7	96	148	94×50×38	63.5	♀	Normal	F	39	10	9	1			do	Calderon.
28	103	147		63.5	♂	Normal, cleared	F							do	Albert.

108	103	151		84	♀	Amniotic bands attached to extremities; twin to 109.	F	27	1	0	1			do	Calderon.
24	104.5	151		64	♀	Normal	F							do	Angeles.
85	105	155			♂	Normal, cleared	F							do	
57	111	165		95	♂	Normal	F							do	
109	112	163		84	♀	Amniotic bands attached to extremities; twin to 108.	F	27	1	0	1			do	Calderon.
72	120	186		112	♀	Normal, macerated	F							do	Do.
86	120	190			♂	Normal, cleared	F							do	Do.
90	125	193.5	79×66×21	119	♀	Normal	F	27	5	4	1		158	do	Castañeda.
110	135	196.5	93×80×25	110	♂	Amniotic band constricting left ankle.	F							do	Do.
87	135	200			♀	Normal, cleared	F							do	Do.
75		[c] 32×43			♀	Normal	F							do	
55	137	199	130×105×18	205	♀	do	F	33	3	2	1			do	Parrish.
47	141	214		240	♀	do	E	26	3	1	2			do	Saleeby.
91	144	220.5		192	♂	do	F							do	Castañeda.
88	148	210			♂	do	F							do	
50	149	224		295	♀	do	F	35						do	Calderon.
89	150	220			♂	do	F							do	
104	150.8	233			♂	Normal, cleared	F							do	
67	151.5	231.5		129	♂	Normal, macerated	F							do	
53	152	232	102×98×25	227	♂	Normal	F	22	5	3	2			do	
70	153	246	115×93×13	412	♂	do	F	39	9	8	1			do	Calderon.
102	160	255		339	♂	Normal; twin to 103	F	21	2	1	1			do	Lemmon.
22	162.5	234.5		224	♂	Normal	F	24	5	4	1			do	Feliciano.
64	164	252		350	♂	do	F							do	
56	164	260		375	♀	do	F							do	Castañeda.
60	167	255		364	♂	do	F	30	1	0	1		123	do	Calderon.
103	171	265		357	♂	Normal; twin to 102	F							do	
71	171	272		365	♂	Normal	F							do	

[c] Lower extremities only.

TABLE I.—*Showing complete list of human embryos collected in the Philippine Islands*—Continued.

Catalogue No.	Crown rump dimension.	Standing height dimension.	Chorionic sac dimension.	Weight of embryo.	Sex.	Normal or pathological specimen.	Nationality.	Age of mother.	Number of pregnancy.	Full term.	Abortion.	Ectopic pregnancy.	Menstrual age.	Type of pregnancy.	Physician donating specimen.
	mm.	*mm.*	*mm.*	*gms.*									*Days.*		
93	174	254	.....	567	♀	Cyst on left side of head; œdematous.	F	22	4	3	1	.....	? 174	Uterine.....	Calderon.
77	178	297	.....	555	♂	Normal.....	F	.....	.....	.....	.....	.....	.....	....do.....	
107	179	260	.....	370	♂	.....do.....	F	.....	.....	.....	.....	.....	.....	....do.....	Perez.
61	179	281	.....	555	♂	.....do.....	F	22	3	2	1	.....	.....	....do.....	Calderon.
69	180	291	.....	500	♂	.....do.....	F	.....	.....	.....	.....	.....	.....	....do.....	
80	183	281	.....	459	♀	.....do.....	F	.....	.....	.....	.....	.....	.....	....do.....	
73	184	331	.....	862	♀	Hernia of mid brain; cleft palate; hare lip.	F	.....	.....	.....	.....	.....	.....	....do.....	Parrish.
76	185	269	.....	367	♂	Normal.....	F	.....	.....	.....	.....	.....	.....	....do.....	
37	186	276	147×90×12	497	♀	.....do.....	F	26	6	4	2	.....	.....	....do.....	Parrish.
79	186	288	.....	452	♀	.....do.....	F	.....	.....	.....	.....	.....	.....	....do.....	
63	186	293	.....	420	♂	.....do.....	F	27	7	6	1	.....	.....	....do.....	Bautista.
66	192.5	303	.....	537	♀	.....do.....	F	.....	.....	.....	.....	.....	.....	....do.....	
62	195	287	.....	870	♀	Œdematous; stunted extremities.	F	20	3	2	1	.....	.....	....do.....	Ferrer.
81	196	320.5	.....	610	♀	Normal.....	F	.....	.....	.....	.....	.....	.....	....do.....	
54	198	303	155×115×50	975	♂	.....do.....	F	18	1	0	1	.....	.....	....do.....	Parrish.
82	212	342.5	.....	905	♂	Hernia of liver.....	F	38	8	7	1	.....	.....	....do.....	Do.
120	224	338	.....	712	♂	Normal.....	F	.....	.....	.....	.....	.....	.....	....do.....	
92	224	367	.....	1,074	♂	.....do.....	F	.....	.....	.....	.....	.....	.....	....do.....	
38	230	299	.....	1,340	♀	Œdematous; round head	F	28	11	10	1	.....	.....	....do.....	Parrish.
31	230	320	.....	1,440	♂	Ectrodactyla anencephalia.	F	17	1	0	1	.....	240	....do.....	Cabarrus.
14	231	359	.....	829	♂	Normal.....	F	18	3	1	2	.....	.....	....do.....	Pond.
12	233	363	.....	1,210	♂	.....do.....	F	22	3	1	2	.....	.....	....do.....	Do.

185	269	...	387	♂	Normal ...	F	....	.....	.....	.....	.....	.....	.....		.do
186	276	147 · 90 · 12	497	♀	.....do .	F	26	6	4	2	.....	.....	.....		do ..
186	288		452	♀	do	F									do
186	293		420	♂	do	F	27	7	6	1					do
192.5	303		537	♀	do	F									do
195	287		870	♀	Œdematous, stunted extremities	F	20	3	2	1					do
196	320.5		810	♀	Normal	F									do
198	303	155 · 115 · 50	975	♂	do	F	18	1	0	1					do
212	342.5		925	♂	Hernia of liver	F	28	8	7	1					do
224	334		712	♂	Normal	F									do
224	367		1,054	♂	do	F									do
230	299		1,340	♀	Œdematous, round head	F	28	11	11	1					do
230	320		1,440	♂	Ectrodactyla anencephalia.	F	17	1	0	1		240			do
231	350		973	♂	Normal	F	18	3	1	2					do
233	343		1,210	♂	do	F	22	3	1	2					do

10	243	384		1,482	♂	Normal	F	36	8	7	1	7 198	do	F
34	252	397		1,762	♂	Hydrocephalus	F	23	3	2	1		do	F
13	273	424		2,037	♂	Normal	F	23	3	2	1		do	T
11	273	429.5	160×140	1,800	♀	Œdematous condition of right eye.	F						do	N
35	273	440		2,110	♀	Anencephalia	F	20	2	2	0		do	F
119	280	451		1,935	♂	Hernia of liver	F						do	
106	280	460		1,054	♂	Split upper eyelids	F							
3	330	510		2,110	♂	Normal	F	17	1	1	0			F
68	337	467		2,160	♂	Œdematous; stunted extremities.	F							F
Total									266	183	75	8		

10	248	334		1,432	♂	Normal	F	36	8	7	1	? 198	do	Perez.
34	252	397		1,762	♂	Hydrocephalus	F	23	3	2	1		do	Parrish.
13	273	424		2,037	♂	Normal	F	23	3	2	1		do	Tolentino.
11	273	429.5	160×140	1,800	♀	Œdematous condition of right eye.	F						do	Norris.
35	273	440		2,110	♀	Anencephalia	F	20	2	2	0		do	Parrish.
119	280	451		1,935	♂	Hernia of liver	F						do	Do.
106	280	460		1,034	♂	Split upper eyelids	F							
3	330	510		2,110	♂	Normal	F	17	1	1	0			Pond.
68	337	467		2,160	♂	Œdematous; stunted extremities.	F							Parrish.
Total									266	183	75	8		

among the common people, especially in multipara, in which the uterine passages are not properly treated following parturition. This undoubtedly accounts, in a degree at least, for a larger percentage of abortions.

TABLE II.—*Showing the number of normal and pathological specimens from uterine and ectopic pregnancies.*

Month.	Growth.	Uterine specimens.		Ectopic specimens.		Total.
		Normal.	Pathological.	Normal.	Pathological.	
	mm.					
January	0- 2.5	0	5	0	1	6
February	26- 25	7	20	3	9	39
March	26- 68	11	7	0	2	20
April	69-121	13	5	0	0	18
May	122-167	18	1	0	0	19
June	168-210	14	3	0	0	17
July	211-245	4	3	0	0	7
August	246-284	2	5	0	0	7
September	285-316	0	0	0	0	0
October	317-336	1	1	0	0	2
Total		70	50	3	12	135

Total number of uterine specimens, 120, or 88.8 per cent.
Total number of ectopic specimens, 15, or 11.2 per cent.

Table II shows the number of normal and pathological specimens obtained both from uterine and ectopic pregnancies. The numerical index indicating the rate of growth per month is taken from the one adopted from Mall. The largest number of abortions occurred in the second month of gestation. The number then gradually decreases in each succeeding month, with only two abortions in the last month of pregnancy. The largest percentage of pathological specimens, 120, or 88.8 per cent, are uterine, and 15, or 11.2 per cent, are ectopic pregnancies. The total number of normal specimens is 73, or 54.8 per cent, while the pathological specimens number 62, or 46 per cent. Of this latter number 37 per cent are from uterine and 8.8 per cent are from ectopic pregnancies.

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REVIEWS

The Elements | of the | Science of Nutrition | by | Graham Lusk, Ph. D., Sc. D., F. R. S. (Edin.) | professor of physiology at the Cornell University Medical College, | New York City | third edition, reset | Philadelphia and London | W. B. Saunders Company | 1917 | Cloth, pp. 1–641.

This third and enlarged edition of Professor Lusk's book needs no recommendation to those who are acquainted with his former valuable presentations of this subject. To those who have not had access to Professor Lusk's book it may be said that it is a thorough and scholarly presentation of the general methods, data, and facts of our present day knowledge of nutrition in health and disease, to which he personally has contributed so much.

R. B. GIBSON.

A Laboratory Manual and Text-Book | of | Embryology, | by | Charles William Prentiss, A. M., Ph. D., late professor of microscopic anatomy, Northwestern University Medical School, Chicago | revised and extensively rewritten by | Leslie Brainerd Arey, Ph. D. | associate professor of anatomy, in the Northwestern University Medical School, Chicago | second edition enlarged | with 388 illustrations | many in color | Philadelphia and London | W. B. Saunders Company | 1917 | Cloth, pp. i–viii+1–411.

The second edition of Prentiss' Text-Book of Embryology as revised by Professor Arey, is indeed improved and brought more up to date. While preserving the general arrangement of the book, the text has been made more readable and clearer, especially to the student, by important additions and some excellent new illustrations. The rearrangement of some of the very long paragraphs is also of decided advantage. The new chapter on the morphogenesis of the skeleton is a valuable and needed addition. It is unfortunate that this edition also failed to include a bibliography, though this is to a certain extent compensated by the more frequent mention of names of authors and investigators. This book like its predecessor should prove of great help both to teachers and students of embryology.

A. GARCIA.

Chemical Pathology | Being a Discussion of General Pathology from the Standpoint of | the Chemical Processes involved | By | H. Gideon

Wells, Ph. D., M. D. | professor of pathology in the University of Chicago and in | Rush Medical College, Chicago; director of the | Otho S. A. Sprague Memorial Institute | third edition, revised and reset | Philadelphia and London | W. B. Saunders Company | 1918 | pp. 1–707. Cloth, $4.25, net.

From the preface to the third edition:

Despite the war, active investigations in the chemical problems of disease have continued, even in those countries most deeply involved in the conflict. Although some of the later publications of foreign countries have not been directly accessible, but few have not been available at least through abstracts, and it is believed that most of the literature of importance, within the scope of this book, has been considered in its revision, although the rule previously followed of quoting only from the original articles has of necessity been violated in several instances. The new additions to our knowledge in the three years since the second edition was issued have been so numerous that it has again been necessary to reprint the entire work. Several subjects have been largely rewritten, especially Gout, Specificity of Immunological Reactions, Anaphylaxis, Icterus, Acidosis, Diabetes and Uremia. New sections have been added on the Abderhalden Reaction, Specificity, Chemical Basis of Growth, Atrophy, and the Pressor Bases, as well as many briefer additions.

The Principles | of | Hygiene | A Practical Manual for Students, | Physicians, and Health-officers | By | D. H. Bergery, A. M., M. D., Dr. P. H. | Assistant Professor of Hygiene and Bacteriology, University of | Pennsylvania | Sixth edition, thoroughly revised | Philadelphia and London | W. B. Saunders Company | 1918 | pp. 1–543. Cloth, $3.50 net.

From the preface:

This book has been prepared to meet the needs of students of medicine in the acquirement of a knowledge of those principles on which modern hygienic practices are based; to aid students in architecture in comprehending the sanitary requirements in ventilation, heating, water-supply, and sewage-disposal; and to aid physicians and health officers in familiarizing themselves with the advances made in hygienic practices in recent years.

The rapid strides made in our knowledge of the entire subject of hygiene has rendered such a book, based upon the more recent discoveries, almost a necessity to students of medicine.

No attempt has been made to treat the subject in an exhaustive manner, the object being merely to give the general principles upon which the health officer and the physician work in their respective capacities in dealing with conditions which are detrimental to health or which tend to improve health.

The entire range of subjects comprising the comprehensive field of hygiene has not been discussed, but all those subjects which appeared to the author to be most important for those for whom the book has been prepared have received the consideration which their relative importance demanded.

The metric system of weights and measures has been employed throughout the work except in quotations, because this system is now in general

use in all scientific laboratories in the United States, and because it is in every way preferable to the cumbersome and conmplicated system, with its various units, which is still in common use.

Handbook | of | Suggestive Therapeutics | Applied Hypnotism | Psychic Science | A manual of practical psychotherapy, designed | especially for the practitioner of medicine, surgery, and dentistry | By | Henry S. Munro, M. D. | Omaha, Nebraska | Fourth edition, revised and enlarged | St. Louis | C. V. Mosby Company | 1917 | Cloth, pp. 1–481.

The Venereal Diseases | A Manual of Treatment | An Outline of their Management, Prepared | for the Use of Medical Officers of the Army | from the office of the Surgeon General of the Army | September 15, 1917 | Chicago | American Medical Association, 535 North Dearborn Street | 1917 | Cloth, pp. 1–100.

Collected Papers | of | The Mayo Clinic | Rochester, Minnesota | edited by | Mrs. M. H. Mellish | Volume IX | 1917 | Philadelphia and London | W. B. Saunders Company | 1918 | Cloth, pp. i–ix+1–866, inclusive of index.

This volume consists of some hundred or more papers, most of them illustrated, on a variety of subjects of interest to the practitioner. The contributors, thirty-five in number, are all members of either the Mayo Clinic or the Mayo Foundation for Medical Education and Research, and some of both.

The Hodgen | Wire Cradle Extension | Suspension Splint | the exemplification of this splint with other helpful appliances | in the treatment of fractures and wounds of the | extremities and its application in | both civil and war | practice | by | Frank G. Nifong, M. D., F. A. C. S. | with an introduction by | Harvey G. Mudd, M. D., F. A. C. S. | with 124 illustrations | St. Louis | C. V. Mosby Company | 1918 | Cloth, pp. 1–162, price $3.00.

From the preface:

It is a patriotic impulse that impels the author, a neophyte, to make this effort to explain, as lucidly as he may, this appliance and its proper application. He realizes that it could be taught much better by master to pupil; having the knowledge and art passed on from one to another. It is his hope that this may be done, until the great usefulness and efficiency of this splint becomes known and thoroughly popularized. This, then, is the object of this little book. It is written for men thoroughly acquainted with anatomy and the subject of fractures in general. No effort is made to compile a "big book." It is the desire to be as concise as possible, and with singleness of purpose teach the virtues of the Hodgen extension suspension splint.

ERRATA

Page 258: In line 10, *for* THOMPSON *read* THOMSON.
Page 261: In line 27, *for* Bahr *read* Sandwith.
Page 261: In line 28, *for* (1) *read* (6).

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Issued with THE PHILIPPINE JOURNAL OF SCIENCE, SECTION B,
Tropical Medicine, Vol. XIII, No. 6, November, 1918.

PROCEEDINGS OF THE MANILA MEDICAL SOCIETY

REGULAR MONTHLY MEETING, AUGUST 5, 1918

MINUTES OF THE MANILA MEDICAL SOCIETY

The regular meeting of the Manila Medical Society was held at the College of Medicine and Surgery, August 5, 1918, at 8.45 in the evening, with Dr. F. W. Vincent in the chair.

The following members were present:

Dr. F. W. Vincent.
Dr. J. Albert.
Dr. R. B. Gibson.
Dr. H. W. Wade.
Dr. I. Concepcion.
Dr. F. Calderon
Dr. S. de los Angeles.
Prof. F. G. Haughwout.
Dr. R. Fernandez.
Dr. H. Velarde.
Dr. D. de la Paz.

The minutes of the previous meeting were read and approved.

The recommendation of the council with regard to the applications of Drs. Miguela G. Baltazar, Lamberto Leiva, and Florencio Lara for active membership was ratified by the society.

The chairman announced the resignations of Drs. B. C. Crowell and H. G. Maul as councillor and vice-president of the society, respectively. Their resignations were accepted by the society with regret. The chairman also announced the absence for the remainder of the year of Dr. E. S. Ruth, a councillor for three years. He appointed Doctors Albert, Gibson, and Concepcion to constitute a committee on the nomination for vice-president and two councillors.

The society took a short recess.

At the second session the nomination committee submitted the following nominations:

Major John H. H. Scudder, for vice-president.
Dr. H. W. Wade, for councillor to succeed Doctor Crowell.
Dr. P. Guazon, for councillor *vice* Doctor Ruth during his absence.

These nominees were unanimously elected.

On motion of Professor Haughwout, duly seconded, the following resolution was unanimously approved:

That a committee of three be appointed to draft an appreciation of the late Dr. Paul Clements, the same to be spread upon the minutes of the

Manila Medical Society and the Philippine Islands Medical Association and a copy thereof to be transmitted to the family of Dr. Clements.

That this committee include at least one man closely associated with Dr. Clements.

In accordance with this resolution the president appointed a committee consisting of Professor Haughwout, chairman, and Doctors Long and de los Angeles.

Dr. de los Angeles then read a very interesting paper on The Medical Aspect of Criminology: Its Bearing on the Philippines. At the conclusion of the reading of this paper the president asked to be excused on account of an urgent call. Doctor Gibson was then requested to preside over the meeting in the absence of the vice-president elect, Doctor Scudder.

With Doctor Gibson in the chair, the discussion of Doctor de los Angeles' paper was opened, Doctors Gibson, Calderon, Leiva, and Wade, Professor Haughwout, and the author participating in the discussion.

Dr. Lamberto Leiva followed with a paper entitled Mosquitoes around Manila and Vicinity—a Health Problem, which was discussed by Doctors Gibson and Wade, and Professor Haughwout.

The last paper, which was on Endemic Malaria in the Philippine Islands as a Military Problem, was read by Professor Haughwout. This paper was discussed by Doctors Gibson, Wade, and de la Paz, Professor Haughwout closing the discussion.

The meeting adjourned at 11.05 in the evening.

D. DE LA PAZ,
Secretary-Treasurer.

SCIENTIFIC PROGRAM

THE MEDICAL ASPECT OF CRIMINOLOGY: ITS BEARING ON THE PHILIPPINES

By DR. SIXTO DE LOS ANGELES

A plan of procedure is presented for the purpose of establishing a necessary and fundamental system of study and classification of criminals in the Philippine Islands by taking into account the influence of the natural factors of crime generally accepted by criminal anthropologists and sociologists. The report includes a study of the cephalic indices by regions between Filipino criminals and noncriminals, and the incidence of the various cranial anomalies among forty-four dead Filipino criminals

in relation to the character of the crimes for which they were convicted.

MOSQUITOES AROUND MANILA AND VICINITY: A HEALTH PROBLEM

By Dr. Lamberto Leiva

Attention was called to the presence of both the culicine and anopheline mosquitoes around Manila and vicinity. Their relation to disease was discussed briefly. The suggestion also was made that the new and shortened route between the yellow fever zone and Manila brought about by the opening of the Panama Canal may allow certain yellow fever cases which are as yet in their incubation period to pass our quarantine stations unnoticed. The danger, therefore, lies in the possibility of the presence of a Philippine species of mosquito able to transmit yellow fever. So far, *Stegomyia fasciata persistans* Banks has not been proved to be a carrier of this disease. This mosquito and other species of the genus *Stegomyia* are indigenous to the Philippine Islands.

It was stated that two important factors are at work against the spread of malaria in Manila: First, nearly every malaria patient receives ready and prompt treatment with quinine, thereby leading to a great reduction of gametocyte carriers; secondly, the systematic work of the "mosquito brigade," for which no inconsiderable credit is due.

Mosquito control was next discussed. A few remarks were made on the study of the life history of the mosquito as being of importance in applying methods of mosquito extermination. The organization and workings of the "mosquito brigade" of Manila were briefly described. The difficult situation that arises is that a few men are not able to inspect and oil breeding places as frequently as is necessary; namely, every twelve days. It was pointed out that systematic work of this nature is necessary to prevent a new generation of mosquitoes being given a lease of life after the preceding brood has been exterminated.

Mosquitoes, if let alone, are always a menace to the safety and comfort of the human population. It is a health problem that calls for active measures of a sanitary campaign—a condition where eternal vigilance is truly the price of safety, and a false sense of security is fraught with grave danger to even this community.—L. L.

ENDEMIC MALARIA IN THE PHILIPPINE ISLANDS AS A MILITARY PROBLEM

By Professor F. G. HAUGHWOUT

Professor Haughwout's paper dealt mainly with the problem of latent malaria and "malarial carriers" as likely to manifest themselves in the assembling of large bodies of men recruited from endemic centers of malaria. He outlined and discussed some of the methods that have been employed in the detection of latent malaria. The paper also discussed the matter of "quinine-fast" parasites, and recent work on the treatment of malaria by the use of the Roentgen rays.—F. G. H.

R. B. GIBSON,
Editor of the Proceedings,
Manila Medical Society.

Issued with THE PHILIPPINE JOURNAL OF SCIENCE, SECTION B, Tropical Medicine, Vol. XIII, No. 6, November, 1918.

PROCEEDINGS OF THE MANILA MEDICAL SOCIETY

REGULAR MONTHLY MEETING, SEPTEMBER 2, 1918.

MINUTES OF THE MANILA MEDICAL SOCIETY

The meeting was called to order at 8.40 in the evening at the Philippine General Hospital by the president, Dr. F. W. Vincent.

Twelve members were present and one visitor, Major Frank Suggs, of the Medical Corps, United States Army, and medical staff of the Philippine General Hospital.

The minutes of the previous meeting were read and approved.

President Vincent presented the applications of Drs. Amparo Concha, Joaquina E. Tirona, Facundo Esquivel, and A. L. Lejano for active membership. It was moved and seconded that the secretary cast the ballots in favor of the applicants. Carried.

Dr. Potenciano Guázon, author of the first paper of the evening, was absent.

Dr. Gervasio Santos presented a case report of A Vesical Calculus of Unusual Size.

Dr. Regino G. Padua read a paper on Cystolithiasis among the Filipinos in Association with Dietetic Deficiency, which was discussed by Doctors Gibson, Wade, and de Leon.

The meeting was adjourned at 10.15 in the evening.

D. DE LA PAZ,
Secretary-Treasurer.

SCIENTIFIC PROGRAM

A CASE REPORT OF A VESICAL CALCULUS OF UNUSUAL SIZE

By DR. GERVASIO SANTOS

A report of a case of vesical calculus was presented, and the stone, which weighed over 700 grams, was exhibited. The composition of the calculus had not been determined. The large size of the stone and its evident rapid rate of formation were the unusual characteristics in this case.

CYSTOLITHIASIS AMONG THE FILIPINOS IN ASSOCIATION WITH DIETETIC DEFICIENCY

By DR. REGINO PADUA

The observations of Osborne and Mendel on rats indicate a possible association of dietetic deficiency with the formation of

phosphatic urinary calculi. The Filipino diet is essentially of an insufficient and limited character, particularly from its avitamino nature. The results of the present investigation show that a relation apparently exists between the general dietetic inadequacy and deficiency among the Filipinos and the incidence of phosphatic calculi, in contrast with the reported predominance of uric acid and urate calculi in Europe and the United States.

R. B. GIBSON,
Editor of the Proceedings,
Manila Medical Society.

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